April 27, 1965 A. WYZENBEEK 3,180,625

POWER TRANSMISSION MEANS FOR CONCRETE VIBRATOR

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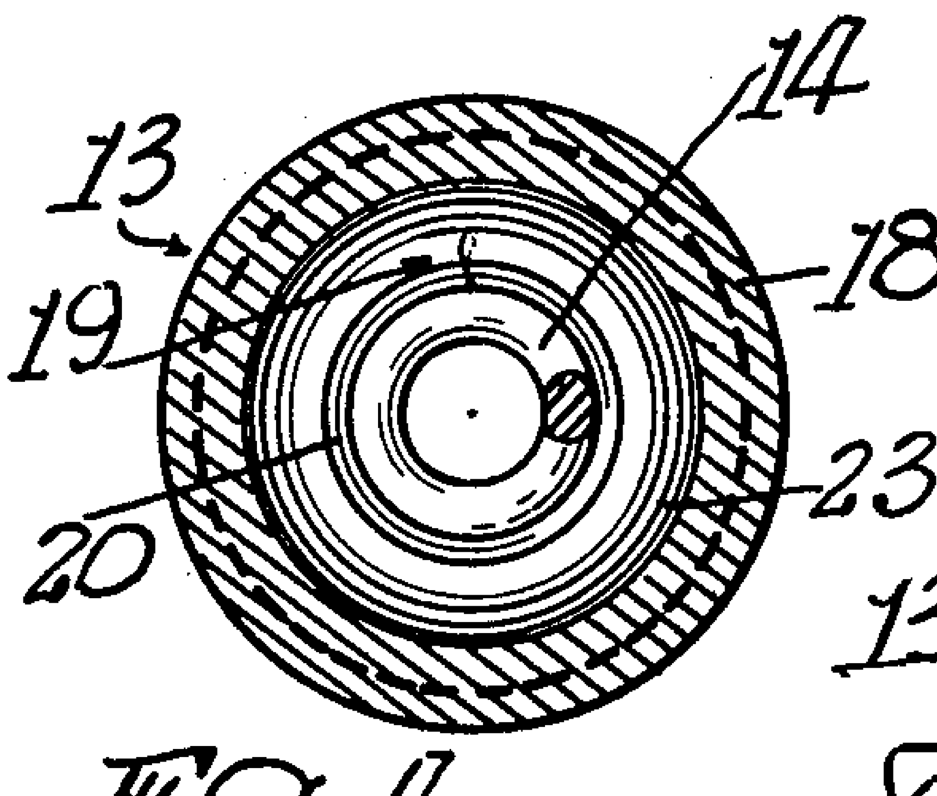

Fig. 4.

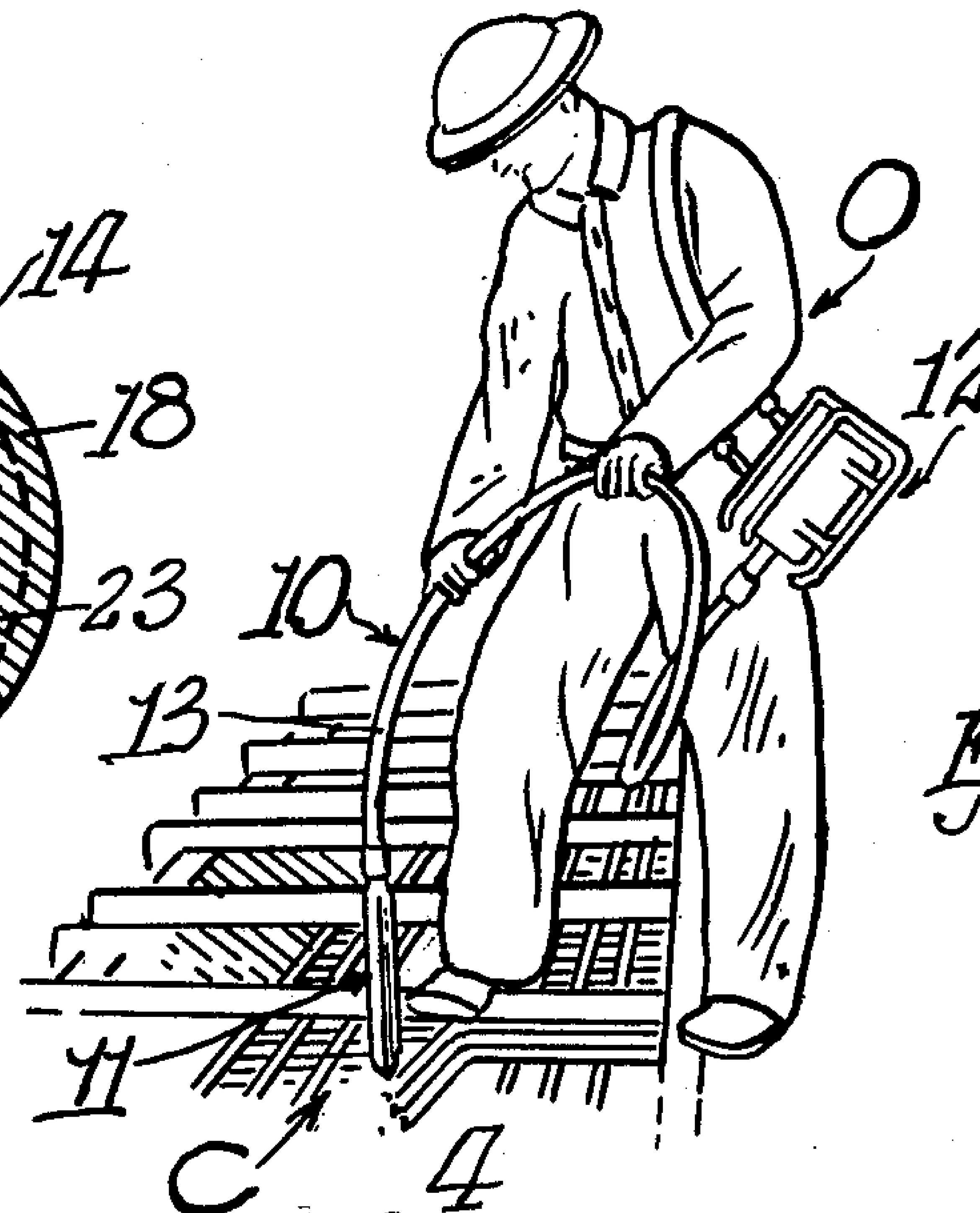

Fig. 1.

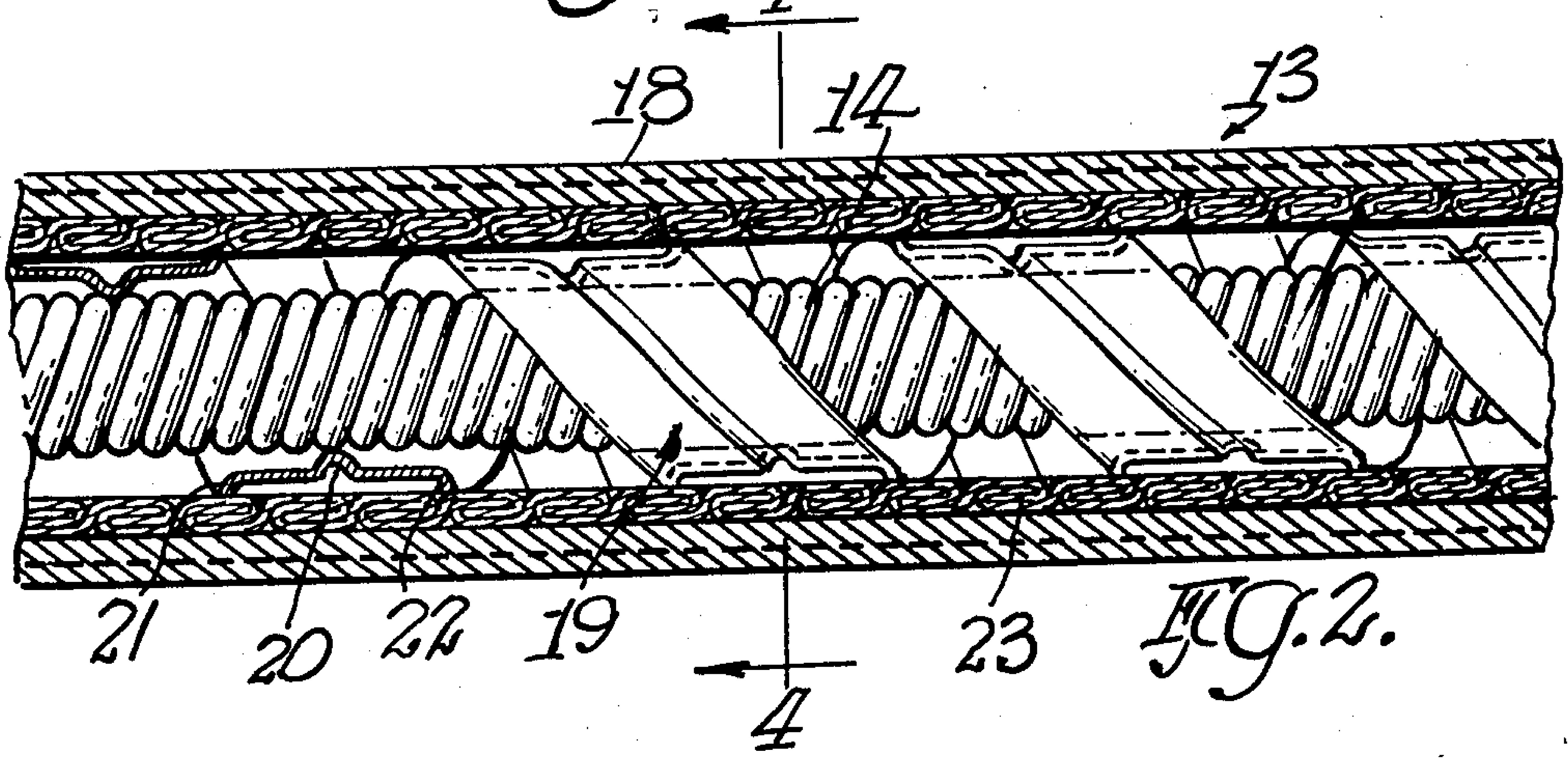

Fig. 2.

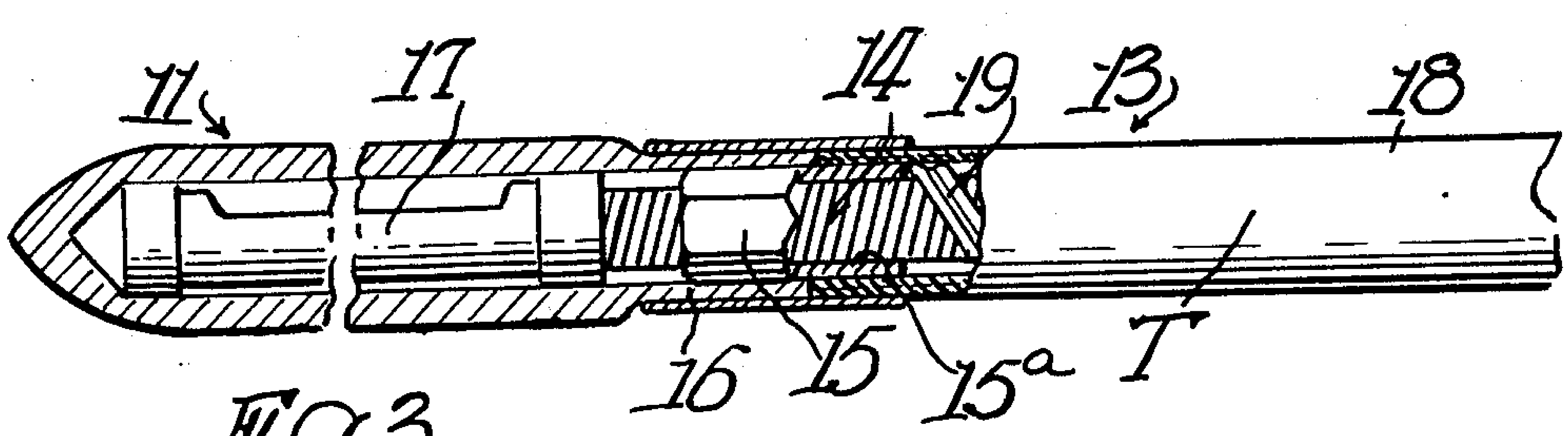

Fig. 3.

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POWER TRANSMISSION MEANS FOR CONCRETE VIBRATOR

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This invention relates to a power transmission means for a concrete vibrator and, more particularly, to a flexible shaft for interconnecting the prime mover with the vibrator head of such a vibrator.

Although vibrators have long been used for compacting concrete, the operation has been limited by the ability of the conventionally employed flexible shaft to deliver adequate power to the vibrator head over the required periods of time. The flexible shaft is usually arched or looped, depending upon the position of the operator, and thus develops a varying frictional resistance between the interior bearing and the rotating core. It is an object of this invention to provide a superior power connection between the motor and the vibrator head, particularly one which overcomes the heretofore-tolerated limitations in operation of such a connection.

Another object of the invention is to provide a unique interior bearing made up of a spirally wound ribbon of metal wherein the ribbon is longitudinally deformed to minimize frictional resistance.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in this specification.

The invention is described in conjunction with an illustrative embodiment in the accompanying drawing, in which—

FIG. 1 is a perspective view of a vibrator embodying the invention, seen in a typical environment;

FIG. 2 is a longitudinal sectional view, on enlarged scale, of the flexible shaft portion of FIG. 1;

FIG. 3 is a fragmentary elevational view, partially in section, of a portion of the flexible shaft and vibrator head seen in FIG. 1; and

FIG. 4 is a transverse section through the flexible shaft as taken on the line 4—4 of FIG. 2.

Referring now to FIG. 1, the symbol O designates generally the operator of the vibrator generally designated **10**. The vibrator **10** is seen to include a head **11** in the process of being immersed in a concrete member C and which is driven in conventional fashion by a portable motor **12** coupled to the vibrator head **11** by means of the flexible shaft **13**. The shaft **13**, as seen in FIGS. 2–4, includes an elongated core **14** terminating in a hexagon-shaped fitting **15** (designated only in FIG. 3). The core **14** is solder-connected within a reamed portion **15*a*** in the fitting **15** so as to be slidably received within a hexagonally-shaped sleeve **16** provided as part of the vibrator head **11**. The vibrator head **11** also includes the eccentrically mounted rotor **17** seen in FIG. 3. The vibrator head details can be seen in my earlier Patent No. 3,042,386.

The flexible shaft **13** includes an outer casing **18** constructed of rubber which encloses the core **14** and provides a mounting for a spirally wound bearing generally designated **19**. The bearing **19** is seen to be longitudinally deformed along a central line to provide a rib **20** contacting the rotating core **14**. Additionally, the bearing strip **19** may be folded along its edges as at **21** and **22** to develop anchoring or gripping portions which are partially embedded within the casing reinforcement **23**.

The inventive bearing or liner **19** was tested using a Wyco #991–G–10 vibrator wherein a temperature

sensing element was located at five inches from the end of the shaft, i.e., the position designated T in FIG. 3. For purposes of comparison, an identical vibrator was employed with the exception that the ribbon providing the bearing **19** was flat instead of beaded as shown. Testing of the two vibrators was made under the extreme condition of running the head completely out of concrete.

With the beaded-type inner liner **19** shown, the temperature rose in ten minutes from 78° to 167° F., while with the flat inner liner the temperature rose in nine minutes from 78° to 245° F., whereupon the test had to be stopped due to failure of the shaft.

In each case, the inner liners were constructed of Phosphor bronze having an analysis of 90–95% copper and 5–10% tin. The tensile strength in the hard drawn condition was 55,000 p.s.i., the Brinell hardness 88–96, and the melting-point 1661° F. The inner liner in the beaded construction shown had a thickness of $\frac{1}{64}$″, while the flat inner liner had a thickness of $\frac{1}{32}$″, both inner liners being spirally wound on a pitch of 2″.

During the test, there was a noticeable difference in the run-in time of the flexible shafts. With the beaded inner liner shown, the core became seated in the casing much faster, as a consequence of which the vibrator came up to speed quicker.

As seen in FIG. 2, which is approximately full scale, the rib **20** upstands from the ribbon **19** about the thickness of the ribbon. The ribbon **19** bears against the reinforcement **23**, which may take the interlocked form shown.

The edge folded construction as at **21** and **22** is exaggerated in FIG. 2 and normally is developed to a certain extent in the operation wherein the longitudinally-extending bead **20** is imparted to the ribbon **19**.

The rib or bead **20** on the bronze ribbon is exceedingly advantageous through its stiffening of the entire ribbon, causing the ribbon to expand with greater force when placed in the casing so as to anchor the ribbon firmly in place, minimizing any play between the ribbon liner and the flexible core **14**. In contrast to this, the ordinary flat ribbon of bronze has a tendency to set and contract somewhat in use, thereby bringing about an indesirable tolerance or gap. Not only is the flat form undesirable for this purpose, but the free movement of the ribbon inner liner brings about localized areas of stress, causing premature wear and failure.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of explanation, many variations in the details herein given may be made without departing from the spirit and scope of the invention.

I claim:

1. In a vibrator for compacting concrete, a motor, a vibrator head, and a flexible shaft coupling said head to said motor, said shaft comprising an outer casing, a flexible core, and a spirally wound liner disposed between said core and casing, said liner comprising a strip of relatively thin material of uniform thickness deformed centrally of its width to define a longitudinally-extending, centrally disposed rib in contacting relation with said core.

2. The structure of claim 1 in which said liner along the longuitdinal edges thereof is deformed radially outwardly into anchoring engagement with said casing.

3. A flexible shaft for coupling a vibrator head to a motor for compacting concrete, and the like, comprising an outer casing, a flexible core, and a spirally wound bearing liner disposed between said core and casing, said liner comprising a strip of relatively thin material of uniform thickness deformed inwardly along spaced

longitudinal lines to develop a centrally disposed rib contacting said core.

4. The flexible shaft of claim 3 in which the strip is deformed radially outwardly along its edges into anchoring engagement with the casing.

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